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[OFFICIAL NOTICE.]

Ohio Gas Light Association.

OFFICE OF SECRETARY, COLUMBUS, O., Feb. 27, 1893.

To the Members of the Ohio Gas Light Association:

The Ninth Annual Meeting of the Ohio Gas Light Association will be held at Columbus, O., on March 15 and 16, 1893.

The meeting will be called to order at 10 A. M. (Standard time), on the first named day.

The arrangements for the meeting will be the same as they were last year. The sessions will be held in the Employees' Hall of the Columbus Gas Company, corner of Long and Front streets, and the hotel headquarters will be the Chittenden, one square distant. Members are advised to secure rooms in advance.

The following papers have been promised:

1. "The Present State of the Art of Purification in Closed Vessels," by S. F. Hayward, New York City.
2. "A Test of the Backus Heater," by Jerome Penn, Washington Court House, O.
3. "Should Small Gas Companies Put in Electric Light Plants?" by H. L. Hurlburt, Oberlin, O.
4. "Is the Wilkinson Process Economical for a Small Works?" by J. F. Seamon, Uniontown, Pa.
5. "Discrimination by Gas Companies in the Treatment of their Consumers," by G. A. Allen, Zanesville, O.
6. "Governor Burners," by Irvin Butterworth, Columbus, O.
7. "Oils for Gas Enriching," by A. S. Miller, Chicago, Ills.
8. "The Present and Future Competition of Gas and Electricity," by Joseph Gwynn, Steubenville, O.

There will be the usual "Question Box," for which members are requested to send to the Secretary, well in advance of the meeting, any questions which they desire to have answered. The Executive Committee has also recommended that a portion of one session be set apart for "miscellaneous discussions."

The meeting promises to be interesting, and it is hoped there will be the usual generous attendance. Visitors will be welcome.

Membership application blanks may be had of the Secretary.

Respectfully, IRVIN BUTTERWORTH, Secretary.

BRIEFLY TOLD.

PAPERS THAT TEACH.—Some of the dawdling *dillettanti*, whose natural bent is to decry that which they cannot understand—nor is anything so simple that they can understand it—have passed their verdict that the last meeting of the New England Association was not as successful as it should have been—that something was lacking; yet they fail to specify the spice, the presence of which would better have flavored the feast. This failure, however, always accompanies the verdict of the disciple of *dillettanteism;* for, unknowing that which appeals to sober common sense, he must of necessity feel a horror of that lonesomeness which his presence provokes. It is true that the New England meeting was not so successful as it should have been; but this springs merely from the fact that no measure of success would be too great for it to win.

And this brings us along to the conviction that, while the last meeting was not a perfect one, it was—bar the uncomfortable fact that the rigors of the winter season of '92-3, added to temporary physical disability of many whose presence at these annual assemblies is watched for as a matter of course—quite the best, from a technical point of view, of any the Association has ever held. The papers certainly must command the admiration of all; for, while we do not claim that the thoughts evoked by any of them will compel the authors or editors of standard works on gas to at once issue revised editions of the works they stand by, it is nevertheless a fact that every Superintendent of a gas works in America will find, and without much hunting either, something that will set him thinking, no matter which of the papers he pays greatest heed to. Take, for example, Mr. Bush's concise presentation on the subject of "Reports;" what would be more advantageous to at least a score of good sized works in this country than the formulation in such works, to the foremen or lieutenants, of an order that reports—concise and understandable, such as Mr. Bush outlined—*must* be made. The "faithful foreman" is all right—he usually means to do right; but, as the Christian religion teaches, in a voice and with a strength that will not be denied, that faith without good works is dead—so it looks to be with the foreman. If he is faithful to the full, let him jot down the daily record of his men's labor and doings, in such form as will enable his employers to estimate him at his full value; and in the end the faithful foreman will not only have more glory but higher pay. In a general way the points in the Bush paper are taken as illustrations or as evidences of the kernels of sound truth that all the papers read at the last meeting of the New England Association contain, and we are confident that, when our readers have taken in the whole proceedings, as given in our columns, they will agree with us that the meeting was in every sense a complete technical success—the dawdling *dilettanti* verdict "to the contrary, notwithstanding."

The Consolidation at Detroit.—The negotiations that have been pending for some months, looking to the complete consolidation of the artificial and natural gas interests of Detroit, Mich., have been satisfactorily concluded; and those who manipulated the affair should be credited with much tact. For if ever a scheme looked to be an impossibility some 18 months ago, it was this very project of bringing the Detroit gas suppliers together on terms that would be agreeable. Col. Jerome Croul and Mr. Frank Byrne—the latter was the aggressive man of the Michigan (natural) Gas Company—however, seem to have a good deal of glycerine in their composition; but whether so or not, the absolute fact is they managed to coalesce that which looked to be oil and water. The amalgamated Company, which is hereafter to be known as the Detroit Gas Company, will be officered as follows—we presume it is understood that the Companies absorbed were hitherto known as the Detroit Gas Light Company, the Michigan Gas Company and the Mutual Gas Company: Directors, C. P. Huntington, D. M. Ferry, M. W. O'Brien, Jerome Croul, W. H. Wells, C. Weidenfeld, John Byrne, Jr., F. R. Pemberton, F. S. Smith, W. C. McMillan, J. C. Donnelly, F. P. Byrne and Jas. H. McMillan; President, W. C. McMillan (a son of U. S. Senator McMillan); Vice-President and General Manager, F. P. Byrne; Treasurer, M. W. O'Brien; Secretary, J. C. Donnelly. The "working" gas men, however, throughout the country, will admit that we have reserved for the last the news that will please them best. This is the announcement that the Engineer of the consolidated enterprise is no one else than Isaac C. Baxter, whose methods in the old Detroit works need no word of praise from us. The proprietors of the consolidated Company are men of capital and vim, and it goes without saying that such officers as Mr. Byrne in the office division and Mr. Baxter at the works' end are just the ones to conserve the Company's interests. We understand that the illuminating gas rate is to be cut to $1.25 per 1,000, and that quite an expenditure will be made in bringing the old Mutual plant up to the requirements of the day. We should not omit to say that Col. Croul (the only member of the Board of Directors of the old Detroit Company chosen in the consolidated Board) is to be Chairman of the Executive Committee of the new Board, and we congratulate the Company on the excellence of its choice.

A Correction.—In our item columns for February 27, Mr. James Somerville, of Indianapolis, described an odd happening in that city, but in our publication of his account of the affair we unwittingly misquoted him. On page 300, 4th line from top of first column, appears the sentence, "The flame was smothered by the 'chemical' from the fire department, and we tapped a 1½ inch hole in the ground * * *" The closing phrase should have read, "and we tapped a 1½ inch hole in the iron pole."

[Offical Report—Revised by the Secretary—Continued from Page 297.]

TWENTY-THIRD ANNUAL MEETING OF THE NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

Held at Young's Hotel, Boston, Mass., Feb. 15 and 16, 1893.

First Day—Afternoon Session.

The President—Mr. H. A. Allyn, of Cambridge, Mass., will now read his paper on the

EFFECTS OF THE TROLLEY SYSTEM ON GAS AND WATER PIPES.

I can assure the Association it was with a feeling of reluctance and hesitation that I consented to comply with the very modest request of your Secretary to write a paper on the "Effects of the Trolley System on Gas and Water Pipes."

In an unguarded moment I showed a few of the specimens which I have here to day to some of my brother engineers, hoping thereby to gain some information on the subject. But I was at once pounced upon by the President and secretary of this Association as a suitable victim to put on the list for a paper. I hesitated to comply with their request, first, because I make no pretensions whatever to the possession of any technical knowledge of the science of electricity. Second, while I have little doubt that the use of the trolley system has been equally destructive to both gas and water pipes in Cambridge, to the present time, in but one instance have the former been proved to be affected. The trouble was not definitely located until the winter had fairly set in. Since that time you are well aware that the frost has been getting into the ground a little deeper every week, rendering it impossible to make any investigations in that direction.

I shall, therefore, be obliged to depend largely on the information obtained from others, rather than from any researches of my own.

The subject matter of the action of the trolley system on underground work of metallic construction, was first called to the notice of Mr. Charles H. Morse, Superintendent of wires of the City of Cambridge, by a complaint from the New England Telephone Company during the spring of last year. The Telephone Company claimed that the metallic covering of their cables was being destroyed by something, which they firmly believed was due to the action of the ground current of electricity from the trolley wires. Perhaps a word of explanation as to the manner in which these cables are arranged may not be out of place.

The cables vary in size, those in use in Cambridge being about 1½ inch in diameter, and contain a large number of insulated telephone wires each. The sample which I have here contains 120 wires. Each cable is drawn into a lead pipe. This pipe in turn is drawn into a wrought iron pipe. Some 20 or more of these pipes are placed in a wooden conduit, spaces being left between the pipes, which are then filled in with cement concrete.

The top of this conduit is about two feet below the surface of the street. It will be readily understood that the construction of one of these conduits involves the expenditure of a large sum of money, and anything endangering its permanence is a serious menace to the Telephone Company. When we consider that a small hole in the covering of one of these cables means the derangement of all the wires in that cable, we can have but a faint idea of the amount of profanity that will be generated at the ends of those 120 wires when such an accident occurs. When the electrician of the Telephone Company first had his attention drawn to the fact that the cables were being in some manner affected, it was thought that the trouble might be due to the action of the acid used in preserving the wood of which the conduits were constructed. But a simple experiment seemed to fasten the responsibility on the trolley system. A voltmeter was connected with one of the cables in use, and the voltage of the current on the cable ascertained. Two pieces of new cable were then inserted in a barrel of moist earth, the conditions, as nearly as possible, being the same as those pertaining to the cables in use. Wires were then attached to one piece, and a current of the same voltage or force as that found in the ground was passed over it. In two weeks the piece of cable so connected was badly pitted, while the other remained perfect. It was suggested that the railroad company substitute the copper wires under the rails with some of a much larger size. The suggestion was adopted. In Cambridge, wires of about five-eighth inch diameter were employed, while in Boston the whole distance covered by the conduits was protected by a wire nearly an inch in diameter. For a time the trouble seemed to be over.

While a majority of those present are doubtless conversant with the

methods employed in propelling cars by the trolley system, perhaps a few words at this point of explanation may not be uninteresting to those who do not fully understand the matter.

The current is generated by powerful dynamos at the power stations, from whence it is sent on heavy copper wires over the various branches of the road to perform its work. Under the floor of each car is located an electric motor, connected, of course, with a portion of the running gear of the car. Now, the current may be sent out from the station and applied to the car in two ways. First, it may be sent out on an underground wire connected by frequent branches to the rails. In this instance the current passes from the rail up through the running gear of the car to the motor, which it sets in motion; then upward, by a wire conductor, to the lever on the roof of the car, through the trolley wheel to the overhead wire, by which it is conducted back to the power station.

The other method, and that now employed by the West End Railroad Company, is the reverse of that just mentioned—the current in this case leaving the station by an overhead wire, thence through the trolley wheel and lever to the motor; then to the underground conductor and back to the station. Now, under certain conditions, the current, in its endeavors to return to the power station, is liable to leave its proper road, and run "across lots," so to speak, by any feasible by-paths that may present themselves. The paths most easy of access are, of course, the gas and water pipes, and these the current appropriates to its purposes without regard to consequences. Now, if I understand the matter correctly, the action on the pipes which ensues is very similar to that in an ordinary cell of a voltaic battery. Anyone who has been unfortunate enough to have the care of many of these cells must be aware that in the zinc or negative pole a constant wearing away is taking place, necessitating frequent renewals. So with the pipes over which the trolley current happens to pass. No damage results where the current passes on to the pipes; when it leaves them, however, serious results may follow. Perhaps I ought to say that the wires have suffered at times in common with the pipes, but as we are not especially interested in that direction we will let that pass. During the autumn of last year many reports of leaking supply pipes were received at the Water Office. But as most of them came from a district where the soil was not such as would be conducive to longevity in the pipes, nothing for a time was thought of it. But as the reports became more frequent, the Superintendent became convinced that some influence other than the ordinary oxidation was affecting the pipes. The Water Board requested Mr. Morse to investigate the matter, and in a series of experiments he found currents of electricity flowing over the gas and water pipes in all parts of the city, though more particularly near the power station, the district where the supply pipes had been most acted upon. The trouble increased; some of the pipes were renewed, galvanized, tar coated, and "rustless" pipe being each tried in turn, but all were about equally affected.

In some cases new pipes were destroyed in a month's time. Not alone was the trouble confined to the supply pipes. In laying a 12 inch main the packing yarn, while being driven, took fire. The joint maker received some severe shocks, and was obliged to drive his yarns with wood. In a building located on a corner, two water supplies were connected by a copper wire. Sufficient current was passing over the wire to heat it too hot to be held in the hand.

Mr. Morse requested the Railroad Company to connect the mains at frequent intervals with copper wires, more especially at the "dead ends" of the pipes. For a time it was thought this remedy might result in "robbing Peter to pay Paul;" or, in other words, while the change would prove beneficial to the water pipes, it would throw an additional burden on the gas pipes.

Mr. Morse therefore suggested that the gas and water supply pipes be connected by stout copper wires at numerous localities over the city, hoping that this plan might remedy the evil. The Railroad Company expressed a willingness to comply with the suggestion, and were preparing to do so.

Recent tests, however, lead Mr. Morse to think, inasmuch as the gas mains are connected by cement joints, that these may prove a source of protection, and that connecting the supplies might result in harm rather than good.

In a word, the whole question is of such recent origin and presents so many different phases that it seems to me the problem is far from being solved. I mentioned that up to date but one instance had come to our notice where the action of the electric current could be clearly connected with damage to our pipes. This pipe was a 1¼-inch galvanized pipe. After leaving the main it passed under the telephone conduit, then across the street, under two tracks. It was between these tracks that the break occurred. You will notice that the pipe is perfectly sound, except at each side of the coupling where the pipe is eaten through. I have here also a piece of water supply pipe. This pipe was attached to a 12 inch main near our works, and ran parallel with our fence for a distance of 300 feet, to within about 100 feet of the river. The current evidently left the 12-inch pipe and followed the smaller one in its endeavor to reach the river.

This pipe was also galvanized and had been in use only eight months. You will observe that the softer portion of the iron is pretty well eaten away. Here also the parts near the coupling have been most acted upon.

I will trespass no further upon your time. My paper has of necessity been a somewhat rambling one. But I have endeavored to give you such data as I have been able to gather in the limited time at my disposal. The problem seems to me one of the most serious that we have been called upon to solve. If the evil is allowed to continue, it means a loss of thousands of dollars, besides the care, anxiety and possible danger that may result. I would suggest that a committee be appointed to thoroughly investigate the matter, and that the committee have power to secure expert advice if necessary, and forward a copy of the report of the result of their deliberations to each member of this Association.

Discussion.

Mr. Allyn—I will add that Mr. W. R. Addicks, of the Boston Company, very kindly consented to furnish me with some items which I had intended to incorporate in my paper, but for some reason they were delayed in reaching me, and I did not receive them until last evening. What he has sent me is in the form of reports from the different foremen of the Boston Gas Company. We had a case of a 6-inch main, very near the Harvard Square station, which was laid quite deeply—it was nearly 4 feet to the top of the pipe. It came directly under the frogs, where the cars run from a side street out on to the main track. The pipe was broken off. I can hardly think it was due to the frost, but rather to the hammering of the cars on the frogs as they went over the pipe. I have brought here a few specimens of the pipe, and also a photograph.

Mr. Greenough—Are those the only pipes that have been injured?

Mr. Allyn—The only ones that we have located. The trouble was not definitely located until the frost began to go into the ground, but since that time we have had our hands pretty full attending to broken pipes. On account of the frozen condition of the ground it was difficult to make any investigation. When the frost comes out we intend to make a thorough investigation over the whole district. The supposition was that trouble in the water pipes would develop itself much sooner on account of the heavy pressure, and of course any imperfection there would show itself much quicker than would a leak in our service pipes.

Mr. Greenough—What voltage is on your pipe?

Mr. Allyn—It varied very greatly. I would not want to state it.

Mr. Greenough—Can you not tell us the extremes?

Mr. Allyn—No; my expectation was that we would have a scientific gentleman here to-day who would give us all the information required, but I think he is not present.

The President—We counted on Mr. Taber helping us out on this question; and we also expected that Mr. W. R. Addicks would be here to enlarge upon the facts which have been submitted. They may be here later. I think perhaps Mr. Learned can give us a little information about the voltage.

Mr. W. A. Learned—We have not been troubled at Newton with the pipes, so far as we know. I would like to ask Mr. Allyn if he has had any trouble with pipes other than in those localities where the electric railway is?

Mr. Allyn—No; I stated that this is the only instance where the difficulty was really attributable to the action of the current, from the fact that we had not attempted to investigate the matter before the frost went into the ground.

Mr. Learned—Did not Mr. Morse state that there was a difference of 15 volts between your water and gas pipes?

Mr. Allyn—I did not see that statement, but I think he made the statement to me.

Mr. Learned—That was near your works at East Cambridge?

Mr. Allyn—Yes; I stated that Mr. Morse first suggested connecting the supplies together with wires, but afterward changed his mind. It seems that the impression he had at first was that our mains were laid in the same manner that water mains are—with lead joints; and he could not see why there should be so much difference in voltage between water pipes and gas pipes. As soon as I explained to him that our pipes were laid with cement joints, he said that that explained a

question he had been studying over for a long time but was unable to solve. He is now making some tests with gas and water pipes. His method is this: He takes two pieces of cast iron pipe 2 feet long, connected by lead or cement joints; 6 inches on each side of the joint he attaches a copper wire; he then connects an instrument to the wires, to ascertain the resistance at the joint, and then, a foot from that, he attaches another wire on the pipe itself and makes a similar test. He had quite a discussion with some of the electricians. He claimed there would be no more resistance at the joint than there would be on the pipe itself; and they claimed the contrary. They claimed that, owing to the lead joint, there would be a much higher resistance. His theory is that the large amount of metal that exists at the bell overcomes the resistance of the lead joint.

Mr. Greenough—Do I understand Mr. Allyn as saying that where this current goes on to the pipe he expects no difficulty—that it does not hurt the pipe there; but that he expects the trouble to be found near the power station, or wherever the current leaves the wire to find its way back to the station?

Mr. Allyn—At the point where this water supply was located the conditions seemed to be about like this: Mr. Morse and Mr. Pearson, of the W. E. Co., entertain, I believe, this theory—that the return current left the conducting wires of the main line and entered upon the 12-inch water main, which seemed to offer the most direct route to the power station, about a mile and a half away. The tendency, however, was all the time, in this moist earth, to strike off in the direction of the river; and, as soon as it came in contact with the supply pipe, that was the shortest cut, and so it followed it; and becoming overcharged by such a powerful current the metal seemed to give way.

Mr. Nettleton—I think you stated in your paper that the railroad company had laid a copper wire, one inch in diameter, in Boston, alongside the telephone cable?

Mr. Allyn—Yes; as I understood from the interview last week with the electrician of the telephone company, who loaned me this specimen. He said that they had gone over the whole district wherever there was a conduit, and strung along these heavy wires, nearly an inch in diameter. The wire was so large that they hoped it would be sufficient to keep the current off the conduit.

Mr. Nettleton—He did not state whether they had succeeded or not?

Mr. Allyn—They hope it has, and they say that the faults in the cables have been less frequent since they commenced doing this. He showed me two maps, duplicates of each other, one of which showed the territory where they found the currents were running, before they made any changes, and the other showed where they had brought the currents in on these new conductors. They had covered nearly the whole distance. The little space on each side of the city was still unprotected. They consider that the balance of the district is now practically protected.

Mr. Coggeshall—I understood your voltage to be 15. What was the voltage on the gas pipe where the tests were made?

Mr. Allyn—I am not certain about that.

Mr. Nettleton—What method has been followed by the railroad in Cambridge for connecting the rails together, where the rails abut together?

Mr. Allyn—I think that branch wires have been used. Where the large wire runs along the center of the track, at frequent intervals, of perhaps 6 or 8 feet, smaller branch wires are run out, twisted around the main wire, soldered on, carried to the rail, in which a hole is tapped, and a small set screw fastens it securely to the side of the rail.

Mr. Nettleton—Are not some of these connections broken near the point where the pipe was injured?

Mr. Allyn—That is possible, but I do not know it.

Mr. Nettleton—I ask that question for this reason: We have an electric railroad in the town where I live, which was one of the first, if not the first electric railroad in New England, and while I have had no trouble from pipes burned out, my men have had shocks, and we have had a good deal of trouble with the telephone wires. I have seen nearly the whole telephone switchboard drop at once because of the current from the electric road. That trouble has been remedied by taking pains to connect the rails with each other when they butt together, in a substantial manner, to return the current to the generator; and to day you can scarcely hear any noise on the telephone caused by the electric railroad. As far as the gas and water pipes are concerned, I know absolutely nothing about the railroad.

Mr. Prichard—Has Mr. Nettleton cement joints or joints of lead?

Mr. Nettleton—Both.

Mr. Prichard—Scattered?

Mr. Nettleton—Yes. In certain districts I use lead and in others cement. But generally they are mixed together. May I ask Mr. Allyn the quality of the soil where these pipes are laid?

Mr. Allyn—It is filled in ground.

Mr. Stiness—I am furnishing current for the railroad in our city for some nine or ten cars. We have two 30 horse power generators and one of 80 horse power. While we have had no trouble that I know of from any pipes, we do find at our station, in the basement, in the ground, a very large amount of free electricity. We have run a bar underground and found five volts simply from the free electricity. But there is another matter in connection with the trolley system which occurred a few weeks ago—it was a very pretty sight at the time, but it has given me food for a great deal of reflection since then. We have been building a sewer in one of our streets—I don't suppose a case ever occurred before where a gas pipe was broken by the building of a sewer. (Laughter.) I see you have all been there. Well, one of the worst days during the winter a break was reported, and they said the gas was in the sewer pipe. Of course we took pains to ventilate the sewer at once. A car came up the street and turned the curve, where there was a manhole. I stood there, saw a very pretty blue flame, following which the top of the sewer was gently lifted. The current had set the gas on fire just as it struck the manhole of the sewer. Now that is something of importance. Where there are trolley wires in a town, by means of which the gas can be lighted, if the gas is allowed to get into the sewer, that is going to be a very serious matter, because of the contact which can take place from the flash of electricity passing where the gas has escaped. I think Mr. Allyn's paper is certainly to the gas and water people one of very great importance. He makes a recommendation in his paper which we should consider. I think it is due to ourselves and due to the public that this matter be continued, and that a committee be appointed to fully investigate the subject in order that if any means can be found for overcoming this trouble we may know it. I have been informed by parties who claim to be thoroughly posted that it is a matter which can be, and, in all the new systems which are laid to-day, is perfectly overcome. If that is so, of course we wish to know it. An electric car passing over a road under which you have a broken main, with the gas coming up through the ground, is not a very pleasant thing to contemplate. I hope, therefore, this matter will receive the most serious consideration of this Association.

Mr. C. F. Spaulding—I would like to inquire if any of the gas engineers present have found pipes similar to these, previous to the last 10 or 15 years. I have certainly in some soils found pipes with holes eaten through them, like these specimens. I do not doubt but what this was done by the electric current, but it would seem to me there are certain conditions of soil which will affect pipes in a similar manner. In considering some way to prevent this, it struck me, while looking at these pipes, that an insulator of hard rubber might be put in which would shut off the current. That would be one way. I understand they contemplate reversing the current—that for 24 hours they will have the current go back to the station through the track and underground wires, and then for the next 24 hours reverse it and throw it the other way, so that the particles which leave the pipe will be brought back, and it can be kept in its original condition. (Laughter.)

Mr. Stiness—That would be a sort of perpetual motion. I would like to ask Mr. Spaulding if he ever saw a pipe where the trolley does not exist, broken up as this pipe is?

Mr. Spaulding—No, sir; not as bad. I have no doubt but that this was done by the electric current; but I have seen pipes similar to this where the trouble was not occasioned by the electric current.

Mr. Stiness—How many years was that 3 inch pipe in the ground?

Mr. Allyn—I think for 17 years.

The President—That was a part of the original supply to the abandoned locomotive works, which the West End Company bought for a power station. There was no trouble reported until it was turned into a power station. At that time the 3 inch pipe was removed and an inch and a half pipe put in. The inch and a half pipe which took the place of the other lasted only for 8 months.

Mr. A. R. Willard—I notice that all these pipes which are eaten into are of wrought iron. Can some one tell me why, if it is true, the electric current has not eaten the cast iron as well as the wrought iron.

Mr. Allyn—The theory we have, and which we intend to follow out in the spring, is that the action has been just the same on the cast iron, but that owing to the thicker material it has had more opportunity to eat without getting through the pipe.

Mr. Sherman—Gentlemen who are present here, and who are members of the National Association, will remember that at one of our meetings in New York ten years ago, the President of the old New York Company brought in some service pipes which were in the same con-

dition as those we have before us to-day—and there was no trolley system in New York at that time. Those pipes had come in contact with the current conveyed by the Edison system of electric lighting.

Mr. Stiness—I understand you to say that it was electricity from the Edison system instead of from the trolley; so it was due to the action of electricity in either case.

The President—I will state to the gentlemen who have just come in that we are discussing the effect of the trolley current on water and gas service pipes. There are pipes here on the table, from Cambridge and Boston, showing the action of the current. Perhaps some of the members who have come in late may have something to add on this subject.

Mr. Leach—Last year we removed a service that was eaten fully as badly as that, where there was no electric current at all. It was in clay ground, and had been in there for 30 years; so I suppose it was time it was taken up.

The President—Cannot Mr. Humphreys throw some light on the subject?

Mr. C. J. R. Humphreys—I have really had no experience in this direction. We have the trolley in Lawrence, but I do not know that it has caused any leaks in the pipes. I have heard of one case, in one of the Western cities; and if Mr. Ramsdell was in the room I think he could tell you about it. I know that the Superintendent of the Com pany wrote me about it, explaining the trouble they were having there, and his experience was very interesting.

The President—Mr. Ramsdell does not seem to be in the room. If no other member has anything to offer on this subject we will close the discussion.

On motion of Mr. Leach, a vote of thanks was given to Mr. Allyn for his paper.

The President—"Pressure Records on Mains and Services" is the subject of the paper which will now be read by Mr. S. J. Fowler, of Springfield, Mass.

RECORDING PRESSURES ON MAINS AND SERVICES.

The desirability of knowing how gas is delivered to the consumer has long been prominent in my mind, since the mains laid for the supply of certain sections may often be called upon to furnish much more than was originally believed to be the greatest future demand, or inside pipes may be called upon to supply many more burners than were originally contemplated. In these cases dissatisfaction is sure to arise, and often the difficulty cannot be removed for months after complaint has been entered; and hearing complaints seems at times to be the normal condition of the gas works manager.

Of course, the form the complaint takes is generally that of "poor gas;" but, since we in Massachusetts know officially from the reports of our State Inspector that our product is not poor, we are compelled to find out why good gas as made at our works does not perform efficient service at the burner of the consumer. Old and clogged burners are a cause of trouble with which we are all familiar—house pipes and services often, too, become clogged; but these cases being generally isolated and well-defined, we are able to deal with them with ease. Insuffi cient or irregular pressure at the burner is quite a different matter, and is likely to entail much study upon the gas engineer and much expense upon the company before its cause can be removed. With the desire to make the acquisition of data more easy and more certain, I have had made, and now place before you and submit to your inspection, a simple and convenient form of registering pressure gauge.

It consists of a float working on the same principle as the common arch pressure gauge, to which is attached, by proper connection, a pen which marks the pressure of the gas on a dial, which is revolved once in a week by means of suitable clockwork.

Owing to unforeseen circumstances, I was unable to get enough of these machines to try them simultaneously at as many points as I had intended, nor have I been able to get a whole week's record; and I apologize to the Association for presenting a paper in which so few data appear as a foundation. Such facts as I have been able to gather I offer for consideration.

Before bringing to your attention the results of the working of the pressure gauge, a few words descriptive of the topography of Springfield, where the tests were made, and of the system of mains there, are in order.

The city is on the Connecticut river, and occupies a level stretch of land, generally about half a mile in width, from the east side of which rises a hill of nearly 140 feet in height. Beyond the brow of the hill the land is generally very level, and is separated from the rest of the city by the large plot of ground occupied by the Cemetery and by the U. S. Armory grounds. Originally the town was situated on the low land, but with the growth of population it has spread to the high land, and now continues to expand in that direction.

The map before you (see p. 330) shows the two sections, divided on a difference of level of 100 feet from the level of Main street. The mercantile and manufacturing interests of the city are mostly located on the lower level, which has largely been deserted by gas consuming residences, which have gone on to the "Hill," so called, or onto the rising ground intermediate between the low level and the plateau behind the Armory and Cemetery.

The gas works are located near the river, and about midway between the north and south lines. The yearly output is somewhat in excess of 80,000,000 cubic feet, and is distributed as follows:

In the district colored yellow, situated north of the Boston & Albany Railroad, which may be taken to be the northerly boundary of the mercantile district, 18 per cent., or about 14 millions of feet. In the district colored red, and situated east of Chestnut street, which marks the foot of the hill at the east of the low-lying land, and so is the easterly boundary of the mercantile district, 24 per cent., or about 20 millions, one-half of which is used on the side hill and the other half on the plateau back of the Armory. In the district colored ochre-yellow, situated south of the mercantile district, 26 per cent., or about 21 millions. In the mercantile district, at the center of the city, 32 per cent., or about 25 millions.

On working out these distribution tables, I have been surprised to find that we had so large an output in the center of the city, for most of the stores seem to be lighted with electricity or oil. The result shows, though, that we are still doing business.

The system of mains comprises a 16 inch, reducing into a 12 inch main, running from the works, *i. e.*, from one corner of what I have called the mercantile district, northerly parallel with the main street, then continued easterly to Main street, and thence northerly beyond the railroad, where it joins on to two 6 inch distributing mains. About midway between the railroad and the works there is a 16 inch, and eventually a 12 inch main, running directly across the mercantile district to the foot of the hill (Chestnut street), where it is connected with 6 inch mains, each way on Chestnut street, and an 8 inch and eventually a 6 inch main leading up the hill.

Besides the main supply, there is also a 12 inch main, leading easterly from the works along the southerly border of the mercantile district, which is continued in 10, 8 and 6 inch pipe up the hill. The two main supply pipes are connected by a 10 inch main, running parallel with the river to the east of Main street, so that the mercantile district may be said to be supplied by a parallelogram of 16, 12 and 10 inch pipe. In the main street we have 3, 4 and 6 inch pipes connected to the larger pipes through the cross streets. South of the mercantile district we have three lines of 6 inch pipe.

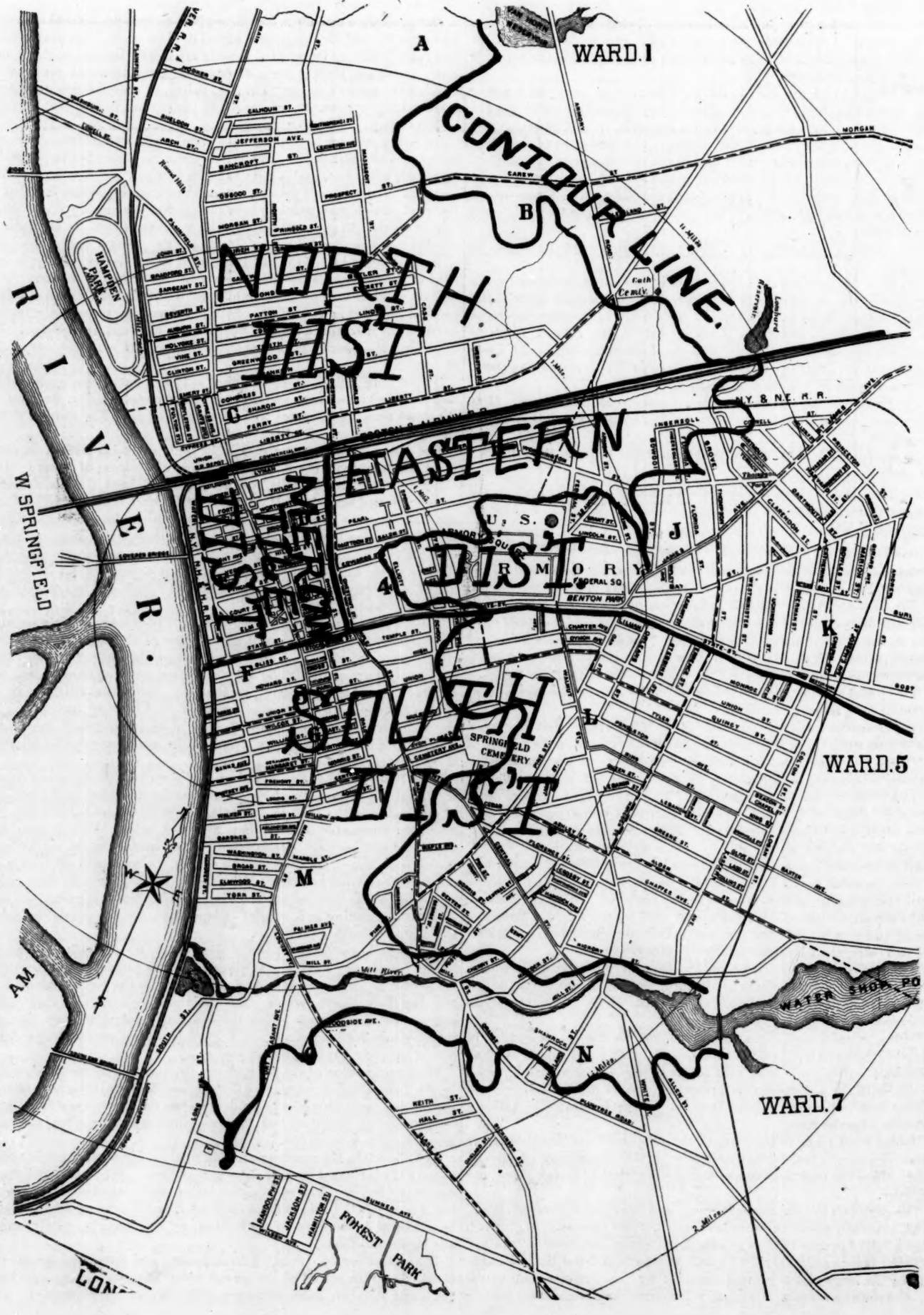
Now I had hoped to show you cards of simultaneous pressures at our works, at the extreme north end of our northern section, at the east end of our mains on the Hill, on our extreme southerly, and also in the center of the mercantile district; but, as stated before, I have been disappointed and am only able to submit to you cards from the works from the extreme east, from the southern edge of the mercantile district, and one day's run from half-way up the Hill. The attachments were made at the end of the services by removing the plug from the end of the service tee and putting in a capped independent, on which was adjusted the necessary rubber tubing.

We have a governor at the works which we use only on a small holder for our day output. At other times the pressure is direct from the holder on to the mains. And now to turn to the results obtained by running the pressure gauges. The dials are so small that they could not be seen, if presented before the company assembled here, though they are here for inspection, and I have therefore prepared the chart (see p. 331) now hanging before you.

The upper section of the chart shows the pressure as recorded at the works, from which it is apparent that we use about a 2-inch pressure during the day, until it begins to get dark, when the full force of the holder —3½ inches—is turned on and kept on until midnight, when we once more come back to about 2 inches.

At 5 o'clock in the morning an additional half inch pressure is added to meet the increased consumption at that time. We undoubtedly put our heavy holder pressure on to the mains earlier than it is necessary, but it is certainly better than to do it too late. So far as pressure can be managed by hand we do not feel that we are acting unwisely under our local conditions.

The second section, counting from the top, and numbered one on the chart, shows the record of the gauge from Thursday, P. M., February 9th, until Monday, noon, February 13th (day before yesterday). The


A
WARD.1
CONTOUR LINE.
B
NORTH DIST'
EASTERN DIST'
WESTERN DIST'
SOUTH DIST'
U. S. ARMORY
SPRINGFIELD CEMETERY
WARD.5
WARD.7
RIVER
W SPRINGFIELD
HAMPDEN PARK
FOREST PARK
N.Y. & N.E. R.R.
J
K
L
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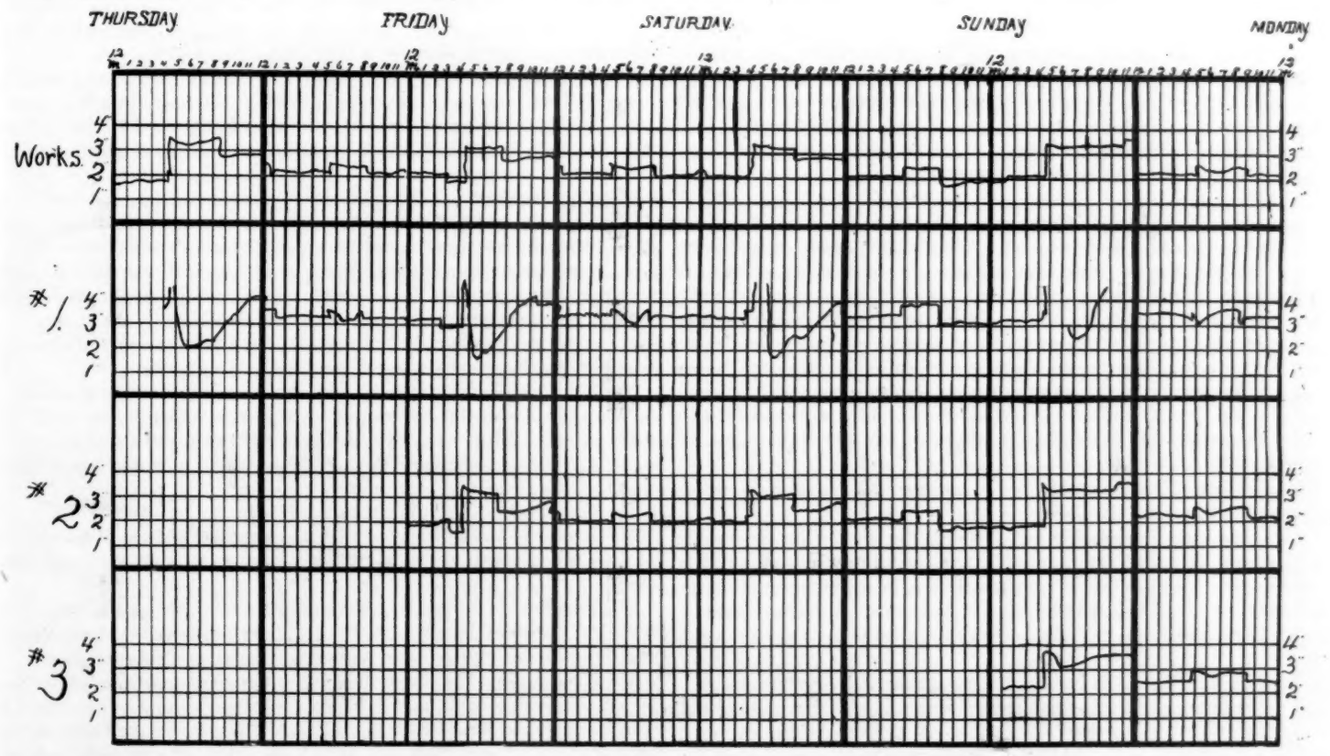

gauge was adjusted on the end of 1 inch service, about 35 feet from the 4 inch main at the extreme eastern end of the system. The level of the street in front of the house is 144 feet above the level of the street, where diagram No. 2 was taken, and also that height above the works.

The third section shows record of a gauge located on a service leading directly from the 12 inch main which borders the mercantile district on the south. You will see that it agrees with great exactness with the record of the gauge at the works, which are distant 1,100 feet. The agreement of gauges show that delivery up to this point is perfect.

The fourth section is the record of 24 hours' run, beginning Sunday noon. This gauge was 40 feet higher than the works, and shows the same pressure as the gauge there, except the difference due to elevation, and a slight depression from half past five until nine in the evening, showing that, on Sunday at least, our pressure is well maintained and that the system of mains is good.

The second section is the interesting one, and one which will probably cause me some trouble before I can get it into proper shape. The elevation causes an increase of pressure of about 1.3 inches, as may be seen by comparing the diagrams at 3 P.M., or 9 A.M., or 3 A.M.—all hours of light consumption. The gauge when first adjusted showed 3½ inches, while the gauge at the works showed 2.1; but immediately, when the full pressure was put on at the works, the pointer on the Hill jumped off the paper, showing a pressure of more than 4.5 inches. In about half an hour the consumption on the line had so reduced the pressure, however, that the pointer came back on to the paper again, and began to take the back track to such an extent that by 6 o'clock the gauge showed only 2 inches, or 1.2 less than was shown at the works - a total loss of pressure, therefore, of 2.5 inches. The next day being darker and our output greater, there was a direct loss of 1.4 inches, or a total of 2.7 inches. That the variation of pressure during the evening was at best 2 6 inches the cards and diagram show, but how much more it was we can only compute. I reckon it to be 2.9 inches.

So far as the Company is aware, the service given on the Hill is perfectly satisfactory; but how long it would continue to be so under the conditions given above I cannot tell. This is just one of the cases to which I alluded in the opening paragraph, where "mains laid for the supply of certain sections may be called upon to furnish much more than was originally believed to be the greatest future demand." This section of our city has been growing very fast, and extensions have been made with a view to satisfy the immediate wants. How many more houses would have to be built and occupied—how many more consumers we should have to get to bring our pressure down another inch I cannot tell; but I can promise you that the problem is one which never will be solved in Springfield.

That such a chart should be obtained from any service in our city is a surprise to me—an extremely unwelcome one as you can well believe; but at any rate I have a case in hand to point the moral that it is well for the gas engineer to *know* how his gas is delivered to the consumer, so that he may not only remedy present complaints, but also anticipate future ones. My present experience convinces me of the advisability, if not necessity, of testing the pressure on the mains thoroughly throughout the whole city.

Discussion.

Mr. Allyn—I would like to enquire of Mr. Fowler if it would not be possible for him to control the pressure in that high district by an automatic governor; or are there too many mains?

Mr. Fowler—We have really only two mains running up there, and it would undoubtedly be comparatively easy to do it. There is quite a long slope, so that we should have to divide the city somewhere in going up the hill. At present we have a 6 inch Main through State street, and another 6 inch main over in Worthington street. It is, of course, practicable to control the pressure, but we hardly get sufficient pressure now.

Mr. Allyn—It seems to me that it would be practicable to run an independent main of pretty large capacity from the largest main, connecting those 6 inch mains to it, and then control the whole by one governor. Of course, at the point alluded to, where the pressure is really too low, he would then, on account of the high elevation, get as much pressure as in any other part of the city.

Mr. Fowler—The map before you is on a scale of 1,000 feet to the inch. That would require us to run that large main from the works, probably a little southerly, about 1,200 feet; and to get into the district under discussion would take about 8,000 feet of large main.

Mr. Allyn—We find some surprising things with regard to street mains. At Cambridge we had an application quite a number of years ago to extend our main over into the town of Medford, for the purpose of supplying some of the buildings of Tufts College. That, in a direct line, is about 3 or 4 miles from any holder we have; and the mains in that direction were comparatively small. We had nothing over a 6 inch main there; and the majority were 3 and 4 inch. We had grave doubts about sending gas so far without going to heavy expense in laying some large trunk mains; but they were so desirous of having it done that we finally extended the pipe, putting down 1¼ or 1¾ miles of 3 inch main on the end of the 3 inch main that we already had. A short time ago two large dormitories, containing about 36 rooms each, were added to the buildings. I inquired if there was any lack of pressure. They replied that there was no lack of pressure, but there was sometimes a lack of money to pay the bills.

Mr. McKay—I would like to ask Mr. Fowler the location on that map of each one of those gauges.

Mr. Fowler—(Referring to the map)—The upper gauge is here at the works; the second one is at the eastern end; the third is at State and Main streets; the fourth. of which I have only one day's run, is at my own house. We are selling, in this red district, east of the place where the contour lines run, about 10 millions cubic feet per year; and it is supplied by two 6 inch mains. It seems to me the supply ought to be large enough not to have the pressure drop as much as it does.

Mr. Neal—Your holders are all at the works.

Mr. Fowler—Yes.

The President—As this is a very interesting paper, I hope you will not let the discussion drop here. I think the fact is that a large majority of companies are content with the pressure gauge at the works; and if that is up reasonably high, they consider that the pressure is ordinarily sufficient for all practical purposes. The district test which Mr. Fowler has made, enabling him to ascertain at a glance the situation at the weakest part, is a most admirable idea, and is one that can be followed out to advantage by every member here. It was a source of astonishment to Mr. Fowler when he found a difference of 2.9 inches between his works and part of his district which was 140 feet higher than his works. Did I not understand him as saying that?

Mr. Fowler—No. There was a difference of 2.9 in pressure within half an hour at a certain place.

The President—I think the test through the district on the services with an ordinary pressure gauge will surprise almost any of you who have never tried it, to find so much variation in different parts of the territory, although you may have no complaints of lack of pressure.

Mr. Greenough—Is it a fluid which you have in that machine of yours?

Mr. Fowler—Yes: it is just the same as in an arch pressure gauge.

Mr. Greenough—In this connection I would say to Mr. Fowler that I had the other day my attention called to a pressure gauge which makes a mark similar to that, but which is arranged somewhat differently. You have seen a description of it in the AMERICAN GAS LIGHT JOURNAL.* It is shaped like an accordion. The gas is introduced on the inside; one side is held firm by a band, and the other side moves a pencil. A man brought one to our office and said he would like us to try it I expressed a willingness to have him try it in our office alongside of our pressure gauge. I had it tried there for 3 or 4 days, and I was very much surprised at the accuracy of the reading, and the very great delicacy with which it registered. It registered much more closely than the regular pressure register which we had; and as it has no liquid in it of any kind, it is, of course, easier to transport than one can be in which you have a fluid, and from which a person is liable to spill the water. I bought this machine and propose to use it in different parts of the district in the same way in which Mr. Fowler has proposed to use his. I think it has advantages over a machine with liquid in it, as can be readily seen—unless the cost is too great.

Mr. Fowler—I had not seen that picture, nor any picture of it, at the time I got up the little model of this affair. When we had our Director's meeting here, in January last, I proposed getting up some of these before having seen the other, and followed out my original plan, although I knew that that machine was on the market. I first wrote to the manufacturers and asked them if it had a clock to run a week. I think that is advantageous. The possibility of getting a week's run is better than merely getting one day's run. This makes a seven days' register.

Mr. Greenough—Is that a seven days' register which you have on now?

Mr. Fowler—That is a register taken here in the hotel since last night. No. 3 of the chart is a register taken off of part of one dial. There is one complete revolution in 7 days. The dark sections of the dial are nights, and the light sections are days. It makes no difference if the gauge is left on for 4 days—you are sure of having a 4 days' record; whereas, if the dial revolved once in 24 hours, the record would become blurred, unless the cards were changed at or before the hour when the clock was started the day before.

Mr. Greenough—I agree with you entirely; and my only criticism would be that the time during which the change takes place in pressure would be very sharply depicted on a gauge like that.

Mr. Fowler—That is true; but does that make very much difference? The duration of time, to my mind, is not so much affected as is the change which occurs.

Mr. Coggeshall—I would ask, as to the upper location where the test was made, what size of pipe that was on?

Mr. Fowler—A 4-inch pipe.

* See JOURNAL, Dec. 19, 1892, p. 870.

Mr. Coggeshall—Might not the difficulty be from the hoar frost collecting inside the pipe and shutting off the supply, so that when they were all burning the pressure would go down?

Mr. Fowler—I do not believe there is any such difficulty. That is the end of the pipe, to be sure; but not very far from that side pipes are coming in. It is a gridiron way of distribution up on the hill, and I do not see why it should be affected, unless we had a great deal of hoar frost in the pipes.

Mr. Coggeshall—We have had a very severe winter, and with us a 6 inch pipe was so filled with hoar frost as to shut the pressure off from 2½ to 1 inch when they were all burning. In certain sections of Fitchburg, when lights are all burning, say from 5 to half-past six, the pressure goes down, so that I have had a great many complaints; and I have found the trouble to be from the hoar frost.

Mr. Fowler—I have only had these figures since yesterday afternoon, and I have not yet been able to locate the trouble at all.

Mr. Shelton—Those of us who are interested in this matter would like to know the cost of this pressure gauge, and whether home made or made outside. How much will it cost to rig up four or six of them?

Mr. Fowler—I am told by the gentleman who is to manufacture them that he is going to sell them for $20.

Mr. Greenough—The other form costs $40.

Mr. Shelton—I would suggest that the name and address of the maker of these machines be given, so that we may correspond with regard to them.

The President—Cannot Mr. Shelton get that information privately from Mr. Greenough or Mr. Fowler? There has been objection made at different times to using this Association for advertising purposes.

Mr. Greenough—I am sorry to say that the gentleman cannot use me for an advertising medium, for I have forgotten what his name is. I would suggest to Mr. Fowler that instead of regretting the fact that the pressure falls off as rapidly as it does, he ought, on the contrary, to congratulate himself, because it shows a large consumption of gas.

Mr. Fowler—The surprising thing to me is that the pressure falls off just before 6 o'clock, and then goes up again. For instance, on Saturday, at 8 o'clock, we had 2½ inches, which was fair enough; but that pressure was taken, I believe, by our consumption down here in the stores, and not by the consumption up on the hill. There is the point I do not understand. We get good pressure at the southeast corner of the mercantile district; and from there we have a 10 inch pipe, an 8 inch pipe and a 6 inch pipe up the hill. I do not understand why the pressure away off up the hill should be so much affected by what I might call the mercantile draft down the street. That is one of the problems that I must figure out. I believe there must be a stoppage somewhere in that pipe.

Mr. Greenough—That is no larger variation of pressure than occurs in a great many large cities.

Mr. Nettleton—The district that I supply has a village some 3 miles away from the works, and the consumption has grown since the pipes were laid, with the consequence that the pressure has been reduced. In order to find out what the pressure is at the weakest point of supply I have for several years used a recording gauge, but not nearly so good in some respects as that which Mr. Fowler has shown us. The one I have makes a daily chart, and all through the winter I am obliged each day to send to this point, at very considerable expense, to find the pressure of the night before, and to put on a fresh chart. I think, however, that a gauge of this sort, giving a weekly chart, would practically accomplish the same object and would save five of the six trips per week.

Mr. Lamson—I think the loss of pressure is largely due to friction. The varying rate of delivery is something that we do not altogether understand, and there are no good tables which will help us out. We laid in Worcester this year a 20 inch main from our works, up through Main street, past where our office is, perhaps 1¼ miles away. I anticipated that this main would give us practically the same pressure as we had at our works, during the general consumption; but I was much astonished to find that it did not. I followed the matter up and found that practically in the daytime we have from ½ to ¾ of an inch pressure more at the office than we have at the works, but between 5 and 6:30 o'clock we will have from 1 to 1½ inches less at the office than we have at the works. I think this is due to the greater consumption and to the greater speed with which the gas goes through the pipe, and, consequently, the greater amount of friction. At the time I had the subject in my mind I had some talk with engineers in New York, and recollect they told me that, at the 14th street station, the pressure of the gas on their 24-inch main going out from the 14th street station fell 1 inch in about 150 feet from the works. They also told me the loss from friction was shown very strongly in the fact that they laid a 24-inch pipe from 18th street to

the Battery, with no outlet until it reached the latter point, and they pumped the gas down to the lower part of New York through that pipe. Although that gas started with 24 inches pressure, they never could get it beyond 1 inch pressure at the Battery.

Mr. Willard—If Mr. Fowler will allow me the use of his chart for a moment I think I can point out some of the trouble there, as I had nine years' experience in that place myself.

Mr. Fowler—I was hoping we should hear from Mr. Willard about it.

Mr. Willard—About four years ago we had trouble with these pipes, and in this district on the Hill we could not get, at the time of full consumption, above 1 inch pressure, while at the works we had 3 inches. From the works up Water street there is a 16-inch pipe, which runs to Pynchon street, from which point to the B. and A. Railroad it is a 12-inch pipe. Down Water street, as far as the new holder, it is 16 inch pipe, and around to the new holder it is 16 inch; up State street it is 12-inch to Main street. Then to Dwight street it is 10 inches; then, part of the way up the Hill, it is 8 inches, or about to Byers street, and the rest of the way it is 6 inches. This section on the Hill, which you say takes 10,000,000 feet, is supplied by this 12 inch pipe, reduced to 10, 8 and 6-inch, respectively, and also a large part of the commercial section bounded by Water, Bridge and Dwight streets, and practically the whole of the city south of State street, with the aid of the 6 inch pipe, which was laid up Worthington street some four or five years ago, and which, if put in in accordance with the advice of the works' superintendent, at 10 or 12-inch, instead of 6 inch, would, in my opinion, have obviated the whole trouble.

Mr. Fowler—Mr. Willard had 9 years' experience here, as he has said; but I have taken the gauge at Water street, where we have three 6 inch pipes to feed the south end. One is here at Water street; the next is on Main street, or just west of this green spot; the third one is through Maple street, by this other green spot. Those are the three mains which are the real distributing mains for the south end of the city. Now, gauge No. 2, on this chart (which practically agrees with the chart at the works), was taken off the 12 inch main after two of those 6 inch mains had come off of the 12 inch; so that there is really no loss of pressure shown by the two 6 inch mains going off.

Mr. Willard—The consumption between Water street and Main street is practically nothing. At the north end of Main street, above the B. & A. Railroad, we had practically, at the same time, the same trouble. We could not get in this section of the city over 1 inch pressure. That pipe on Main street was dug down to and tapped once in 50 feet, and a wire cable was run from one hole to the other, looking for the stoppage, yet in the whole length of Main street, above the track to Carew street, nearly half a mile, no stoppage was found. After they changed the grade of the street and railroad, we were obliged to put in a larger pipe there, and I think they have had no trouble in that section of the city since. If the Hill section of the city were piped larger, I think they would get rid of the low pressure on the Hill. It is in this section of the city, from State street, between those two 6 inch pipes, where the connections are all 4 inch, for an area of more than half a mile square, the low pressure shows, and as a remedy I would suggest that Mr. Fowler lay a large pipe from the 24 inch main on Water street to the center of distribution of the district.

Mr. Prichard—I want to agree with what Mr. Lamson said about the carrying capacity of pipe not agreeing with the tables as published, and that we cannot rely on them. I have a short piece of pipe, less than 1,000 feet—I do not recall the exact length now—and according to the tables and the calculations there should not be a loss of over 0.2 inch pressure in going from the holder a distance of 1,000 feet, with no consumption taken off; but the actual loss on that pipe is nearly 1 inch—it is a 20 inch pipe. For the first 300 feet there is no loss; but on the next 700 feet of that 20 inch pipe there is a loss of 0.8 or 0.9. The natural inference would be there was a stoppage in that pipe; but on thorough testing, by tapping holes 200 feet apart, we found nothing to indicate a stoppage. There was, however, a gradual dropping between every two holes.

Mr. Allyn—There was no consumption on it?

Mr. Prichard—None whatever. If members will go into this matter carefully, I think they will be very much surprised to find the drop in pressure that exists, not only in mains all over the city, but to note the difference there is in the pressure on the main and at the end of services in the buildings. If they go still further they will be astonished to find how much pressure they lose through meters. We have followed out cases where there was over 1 inch of pressure absorbed in meter and service pipes, and that, too, where both were apparently all right, and of usual size for the amount of business.

Mr. Lamson—I was astonished at the time I looked this matter up to find how low a pressure some cities worked under. In Worcester consumers expect high pressure. The Company in Boston carries a good pressure. I have referred to the matter of supplying the lower part of New York city on a 1 inch pressure, and they told me in New York that there were a good many places where they only had ¾ inch pressure. The engineers have been working on that, so that now 1 inch is practically the lowest pressure. In New Haven I recollect that they work under a rather low pressure—a pressure which the people here in Boston or the people in Worcester would make a fuss about; but they have to get along by using different kinds of burners.

The President—I think we will have to consider the discussion of this paper closed, as it is our hour for adjournment, and the hotel people want this room in order that they may prepare it for our banquet.

On motion of Mr. Wetherbee, the thanks of the Association were voted to Mr. Fowler for his paper.

Adjourned to Wednesday, Feb. 16, 1893, at 10 A. M.

(To be continued.)

[Prepared for the JOURNAL.]

The New Plant of the Altoona (Pa.) Gas Company.

By Mr. T. W. COLE.

The old plant (a 10 inch works), which was located on 11th avenue near 9th street, having become too small for any improvements and extensions, and the consumption of gas was increasing so rapidly from year to year, a new location was a necessity, as no ground could be procured adjoining the old plant.

A property was purchased on 7th avenue below 1st street, and a new 20 inch works erected, in 1891, under the supervision of Mr. William Gardner, of Pittsburg, as Engineer.

The plot, which is amply large for any improvements or extensions that may be made for years to come, consists of over four acres of ground.

The following is a description of the works, beginning with the retort room.

This room, which at present is about 105 feet long and 70 feet wide, is located on the plot so that an extension of over 200 feet can be made to it at any time when necessary.

A stack of 12 benches of 6's is erected in center of room, and placed back, to back six facing to each side of room. The arches are 8 feet 2 inches wide, in each of which are placed 6 clay retorts, 9 feet long and 15 inches by 30 inches, D-shape. The entire stack is 61 feet long and 21 feet wide. A space is left, between the end of benches and the wall, at one end, of 25 feet. This is intended for a water gas apparatus, whenever that system is to be incorporated into the present process. There is a space of 22 feet between the walls of retort room and the front of benches, giving plenty of room for men to work, and also room to place, at any time in the future, charging and drawing machinery. The foundations of benches are arranged so that regenerative benches can be put in in the future also.

The benches are fitted up with self-sealing mouthpieces, and the stand and straddle pipes are also provided with self-sealing lids. The hydraulic main is the wrought iron, improved.

The gas passes from the hydraulic main, beginning at the farther end of room, from where it is conducted, through a line of 20 inch pipe suspended on one side of room, a distance of 260 feet, before it reaches the exhauster, thereby cooling the gas considerably before it reaches the condensers.

The exhauster is of the "Wilbraham" type and was made by the Wilbraham Brothers, of Philadelphia. The gas emerging from the exhausters passes through a Pelouze and Audoin tar scrubber, through the multitubular condensers (two in number), and on through the "Standard" scrubber, all of the above named apparatus being located on one side of the exhauster room, which is 70 feet by 38 feet.

On the opposite side of this room is an extra exhauster; also an extra standard scrubber, attached to a line of pipe which has the necessary branches to admit of putting in when needed a tar scrubber and new condensers.

All the above machinery is provided with the necessary bye-pass valves and outlet branches, etc. Between this room and the retort room are located the boiler room and a workshop. All the above named rooms, including retort room, are under one roof, which, as before stated, is of iron and slate. All the rooms are separated by brick partition walls.

The next building is the purifying department, which is practically a two story structure, independent of the other buildings, and situated about 25 feet from retort and exhauster rooms building. It is 98 feet by 68 feet, built of brick, and has wood-trussed roof covered with slate.

The first story, or basement, is on level with ground, in which are the center seal and pipe connections to purifying boxes, the bottoms of which latter are 12 feet from floor, giving ample head room under all pipe connections. The boxes rest on 20 inch double, wrought iron I-beams, supported by cast columns. This room is used to revivify the purifying material, which is dropped through two self-sealing openings in the bottoms of each box, and when ready for use is carried above to boxes by bucket elevators, which are run by a small stationary engine provided for the purpose. The center-seal used is of the four-way pattern, one box being arranged with valves, independent of the other three, in which lime is used in connection with the oxide. All four of the boxes can be used at one time, or the center-seal can be arranged so that two boxes only can be used if desired.

The upper room, which is about 68 feet square, contains the purifying boxes, which are 20 feet by 24 feet, and are placed two square, with a space between each box of not less than 10 feet, and a space of 7 feet between boxes and walls of building. The seal to boxes is 30 inches deep, and all pipe connections are 20 inches.

The boxes are provided with lifting carriages to raise covers, which are worked with hydraulic pumping apparatus, by hand. One man can raise them the required height in a very short time.

The other portions of the 98 feet of purifying building, above and below, are separated from the purifying room by brick partition walls. The lower room is for lime mixing, and is also used for an ammoniacal liquor concentrating room. One of Clapp's concentrating apparatus, which was in use at the old works, was erected in it. In this room also are the pumps, etc., for working the ammoniacal liquor and tar. The tar well and the well for concentrated liquor are located in space between the purifying building and the retort and exhaust room building. The tar well holds about 4,000 gallons, and the ammonia well about 6,000 gallons.

There are, a short distance away from purifying building, two iron tanks, the two having a capacity of over 1,000 barrels, erected on trestles 13 feet from the ground, in which any surplus of tar or ammoniacal liquor is pumped up. When a tank load is to be shipped away, a valve attached to a 3-inch pipe is opened, and the tank is filled by gravity. There is also a small pipe attachment by which barrels are filled the same way.

Two hundred feet away from purifying room, and in the direction to gasholder, is located the office of Superintendent and the station meter room, in which are two station meters, one of which was brought from the old works. It is 8 feet in diameter. The new station meter is 10 feet in diameter, and was erected by Messrs. Helme & McIlhenny, of Philadelphia.

The building is 30 feet square and two stories high, built of brick. The only building now left to be described is the coal house. This is located alongside of retort room, 26 feet away, and joined to it by an iron covered way, in which are the scales for weighing the coal. The coal building is 166 feet by 50 feet. It is built entirely of iron and has an elevated trestle, running through the center, the entire length of the building, 12 feet high, from which the coal can be dumped by dropping the bottoms of the cars.

This building was erected by Righter & Conly, of Pittsburgh. The trestle was built by the Pennsylvania Railroad Company, and the siding used for loading and unloading other material than coal was also placed by them.

The contractors employed in the erection and completion of the works are as follows: Stokes & Moore, builders and contractors, residing in Altoona, erected all the buildings except the coal house. The roof trusses of retort house were furnished by Righter & Conly. All the gas apparatus, including bench castings, exhausters, scrubbers, condensers, station meter, purifying boxes, etc., were contracted for and erected by the Kerr Murray Manufacturing Company, of Fort Wayne, Ind. The benchwork was erected by Mr. James Gardner, of Pittsburgh.

The capacity of works is at present time about 750,000 cubic feet per day, but will admit of an increase to 2,000,000 cubic feet, as the line of 20-inch pipe beginning in the retort house continues on to gasholder. The consumption of gas has been so heavy, and the increase over the previous year so great this winter, that the Company is likely to make some important extensions during the year 1893.

A RESULT of the explosion of some weeks ago, at the works of the Lebanon (Ind.) Light, Heat and Power Company, is a suit brought by Martin Hall, who claims that the damage sustained by him amounts to $25,000. Of this sum he charges three-fifths to personal injuries account, the balance to be in compensation for "loss to property."

[Prepared for the JOURNAL.]

Mr. Egner's Figures.

By Mr. JAMES R. SMEDBERG.

As Mr. Egner wishes his article of January 30th to be taken seriously, I ask the courtesy of space for this reply. The subject is of lasting interest; so that no apology is needed for a delay which personal engagements have made unavoidable.

The present criticism is framed from the following data, which are believed to be indisputable:

At zero Centigrade (32° Fahrenheit)—

1 cu. ft. of	hydrogen (H)	weighs	.005597	lb., av.
1 "	oxygen (O)	"	.089328	" "
1 "	nitrogen (N)	"	.078414	" "
1 "	carbon (C), hyp.,	"	.066996	" "

whence are obtained by calculation the following weights of the compound gases concerned:

1 cu. ft. of	carbonic oxide (CO)	weighs	.078162	lb., av.
1 "	carbonic acid (CO_2)	"	.122826	" "
1 "	marsh gas (CH_4)	"	.044692	" "
1 "	olefiant gas (C_2H_4)	"	.078190	" "
1 "	benzine vapors (C_6H_6)	"	.217779	" "

From this complete list are derived the following

Tabulated Elementary Details. "Analysis I."

	Volumes. Cu. Ft.	H. Lbs.	O. Lbs.	N. Lbs.	C. Lbs.	Total, Lbs.
H	149.2	.8351	....	....	....	.8351
O	3.5	....	.3126	....	....	.3126
N	487.1	....	....	38.1955	....	38.1955
CO	222.9	....	9.9556	....	7.4667	17.4223
CO_2	48.5	....	4.3324	....	1.6247	5.9571
CH_4	2.8	.0313	....	....	.0938	.1251
C_2H_4	34.2	.3828	....	....	2 2913	2.6741
C_6H_6	51.8	.8698	....	....	10.4112	11.2810
Total	1,000.0	2.1190	14.6006	38.1955	21.8877	76.8028

Comparison of Elementary Weights.

	Egner.	Correct.
Hydrogen	1.82 lbs.	2.1190 lbs.
Oxygen	15.47 "	14.6006 "
Nitrogen	38.74 "	38.1955 "
Carbon	13.14 "	21 8877 "
Total	68.53 lbs.	76.8028 lbs.

He actually errs in addition, and he most curiously understates the weights of both hydrogen and carbon, although they are his only begetters of heat units.

Now there is *not* 21.887 lbs. of carbon in 8 lbs. of coal and 13.5 lbs. of even the heaviest petroleum; so that the compliment to Mr. Harris's modesty is (to use Mr. Egner's own expression) "pretty effectually disposed of."

I assume that 1 lb. of hydrogen gives 62,535 Fahrenheit heat units,
1 " carbon " 14,544 " " "
and calculate the calorific values per cubic foot of all the gases as follows:

	J. R. S.	Egner.
Hydrogen	347.19 heat units.	343 heat units.
Carbon vapor	974.39 "	....
Carbonic oxide	338.03 "	355 "
Marsh gas	1,187.19 "	1,054 "
Olefiant gas	1,674 40 "	1,681 "
Benzine vapors	3,973.17 "	4,677 "

Mr. Egner takes Atkinson's Ganot as his guide, and quotes from it (Ed'n 1867, p. 353) the preposterous valuation of 13,000 Centigrade thermal units for 1 lb. of marsh gas; notwithstanding that the blunder has been repeatedly exposed, and that the correct Centigrade figures are given in the Encyclopædia Britannica (Art. "Fuel") as 14,675 Centigrade heat units.

Again: His absolutely unaccountable figures for the undecomposed benzine vapors dignify the producer gas as much as those for CH_4 degrade natural gas. It is a queer coincidence.

While 1.82 lbs. hydrogen and 13.14 lbs. carbon would give him but 306 heat units, he makes a volumetric calculation of 433 heat units.

We obtain by calculation from the elements 394 heat units, for—

Hydrogen, 2.1190 × 62,535 ÷ 1,000	132.51 heat units.
Carbon, in CO, 7.4667 lbs. × 10,091 ÷ 1,000	75.35 "
" in CH_4, 0.0938 lbs.	
" in C_2H_4, 2.2913 "	
" in C_6H_6, 10.4112 "	
12.7963 lbs. × 14,544 ÷ 1,000	186.11 heat units.
Total	393.97 heat units.

We also obtain 394 heat units from the gases themselves, for—

Hydrogen.....	149.2 ×	347.19	51,800.748 heat units.
Carbonic oxide....	222.9 ×	338.03	75,346 887 "
Marsh gas.....	2.8 ×	1,187.19	3,324.132 "
Heavy carb. hyd..	34.2 ×	1,674.40	57,264.480 "
Benzine vapors....	51.8 ×	3,973.17	205,810.206 "
			393,546.453 heat units.

But the cap-sheaf of all is the following totally unsupported statement by Mr. Egner of the average composition, by volume, of natural gas—

Hydrogen.....	22.0 per cent.
Marsh gas.....	67.0 "
Olefiant gas.....	6.0 "
Carbonic oxide.....	0.6 "

Now, Mr. Emerson McMillin, in one or other of his many noble contributions to the reliable literature of our industry, quotes the Findlay gas as containing, by volume—

Hydrogen.....	2.18 per cent.
Marsh gas and ethylene.....	92.91 "
Carbonic oxide.....	.50 "

Professor Sadtler states the joint volume of marsh gas and ethylhydride in natural gas as follows—

Wilcox well.....	91.66 per cent.
Erie, Pa.....	98.59 "
Fredonia (old).....	89.73 "
" (new).....	91.55 "

The wells in the Murraysville field yield a nearly pure marsh gas. Eleven localities, cited by Mr. Miller in a paper read before the American Society of Mechanical Engineers, afford natural gas containing these percentages, by volume—

Hydrogen.....	6.13 per cent.
Marsh gas and ethane.....	88.00 "
Illuminating hydrocarbons.....	0.41 "
Carbonic oxide.....	0.36 "

Mr. Egner's errors tend without exception to attach a value, both absolute and comparative, to producer gas which is entirely without warrant.

He tells us that 17,360 cubic feet of gas was made, in 33 minutes, from 44 gallons of petroleum, the gas being of 10 candle power, but states even these solitary facts in a spirit of reservation and uncertainty. Beyond this he gives only a plea for dilution by nitrogen, and a lesson in mathematics which is hardly to be considered as valuable.

Quicksand, the Bane of Builders.

Mr. Robt. L. Harris, of the Am. Soc. C. E., in the course of a lecture before the Engineering Section of the School of Mines, Columbia College, remarked:

Quicksand is a bane of engineers and builders. It has sunk millions of capital, and has caused the abandonment of extensive enterprises. I had known from observation that fine quicksand is widely scattered, but had no idea until recently that it is so extensively distributed. During the past six months I have received complaints of it from Puget Sound to Maine, and between the Gulf of Mexico and Canada, from the interior as well as near the great bodies of water. As cities build deeper, and municipal improvements go deeper still, we learn more of what is beneath than when our works were nearer the surface. The process of which I am to speak is proposed for upwards of 20 engineering superstructures located in 15 different States.

Upon some important work in Providence, R. I., an intercepting sewer, 6 to 8 feet in diameter, a halt had been called on account of the quicksand encountered. The contractors for the worst sections claimed that it was ruinous for them to proceed and had petitioned the City Council to release them from their contracts and cancel their bonds, which was subsequently done. Nearly all the work and trials had been made by the usual methods of sheeting, excavating and pumping out, reducing the water level. These resulted in the sinking of considerable tracts of the original surface 4 to 5 feet, carrying down forest trees, building materials, etc. Experience prompted me to consider the reverse of these processes, that of pumping in material which should solidify the troublesome quicksand in place, while in its normal condition and before injurious sub-currents should be established, in fact to make it its own protector. The problem was separated into three divisions, which, as they represented unknown quantities to be obtained, we will designate by the algebraic characters, x. y, z. These were then, x, to find a cementing substance, fluid or otherwise, that should unite with and solidify this extremely fine and light, yet compact and hard quicksand; y, to form channels and chambers at any depth under ground, and of desired form, without extensive disturbance of the surface or the neighboring materials; z, to fill such chamber and permeate the interstices of the adjacent materials with the cementing substance x. The divisions y and z comprised a pretty riddle. It was to put a fluid, say, 40 feet into the earth and below water level in such a way that it shall mix with the material there for a defined area of, say, 12 x 30 feet, and solidify the same, so that if an excavation is made a month or a century hence, that floor will be found as you now determine; or, if you prefer, let it be a Cardiff giant or any remains of prehistoric cities.

Could a cementing fluid be forced through and into fine sand at a depth below the surface? Would it remain in a cavity already filled with incompressible water? Would it harden sufficiently within reasonable time under the buried conditions and in predetermined shape? Could the pipes be used and removed without being clogged or made useless? A trial was made on the work during the second week in March and in freezing weather, as bad as any experienced during the winter. The answers to the queries suggested were satisfactory. The results, despite the adverse circumstances, were successful, and fully demonstrated the method, and that it would be under complete control. The engineers and contractors of the work promptly and cordially expressed their satisfaction with the trial and their confidence in the new method.

The result is that x, y and z are determined both theoretically and practically. The ultimate results should be far reaching and of great benefit. The method is applicable not only to quicksands but to other sands and the finer earthy materials. The applications are innumerable, enabling engineers and builders to make constructions in many of the fine, loose or soft materials, largely of the substances themselves, at any depth below the surface or of the adjoining material, as for example, shafts, tunnels bridge foundation or canal repairs, water works, sewers, harbors, shore protections, jetties, buildings, etc., and, perhaps, there may be found herein the solution of a difficult problem in rapid transit for cities.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

CHURCH'S patent trays for gas works still meet with satisfactory recognition from the gas makers; in fact, the year just closed seems to have been the banner one, for orders have come to hand for them from every section of the country. The increase over last year in the shipments was very gratifying to Mr. Cabot, and, from the inquiries so far received this year, that gentleman is led to remark "that it looks as if the trade in 1893 will exceed that reported for 1892." We hope so.

THE Middlesex Mutual Assurance Company, of Connecticut, has brought suit against the Middletown Electric Light Company, of Middletown, Conn., for damages in the sum of $40,000, the amount of insurance claims paid by the plaintiff on account of the destruction by fire, in June last, of the Middletown Opera House. Plaintiff claims that the fire was caused by the negligence of defendant in permitting the electric wiring of the Opera House to be performed in an unskillful manner. This suit is sure to attract widespread attention.

DISPATCHES from Cincinnati, O., are to the effect that the Cincinnati Gas Light and Coke Company has secured control of the Cincinnati Edison Electric Light Company.

ADVICES from Bethlehem, Pa., dated Feb. 21, are to the effect that the annual meeting of the South Bethlehem Gas and Water Company was held that morning, under the Chairmanship of Simon Rau, C. H. Nieser acting as Secretary. The annual reports were read and accepted. From these it was learned that the Directors advised that the capital stock be increased from $200,000 to $300,000. The shareholders assented to the increase, and they also directed that the stock be issued by the Directors at their discretion, or as the necessities of the Company seemed to them to demand. The reports also referred to the extensions and improvements underway, specified that the Company was not in debt and that the business outlook was undeniably excellent. The Directors chosen were the following: E. P. Wilbur, Robt. H. Sayre, Sr., Wm. H. Sayre, Wm. V. Knauss and W. A. Wilbur, the latter succeeding to the vacancy occasioned by the death of Mr. Goodwin.

TOWARDS the close of the term of ex-Mayor Orestes Cleveland, of Jersey City, N. J., a contract for the public lighting of that place was entered into with the United Gas Improvement Company, the agreement to last for a period of 5 years. Those who opposed the measure claimed

that the contract could not be legally made to cover a term in excess of one year, whereupon the Courts were appealed to. After various stages, the case came before the State Court of Errors and Appeals, and that tribunal last week handed down a decision setting aside the contract as illegal and void.

THE bids opened in response to an intimation from the authorties of Trenton, N. J., that they were ready to receive proposals for the public lighting, for a term of either 3 or 5 years, were as follows: The Trenton Gas Light Company, to furnish gas for lamps, provided not less than 275 lamps were ordered, at the rate of $25 per lamp per annum, the agreement to run for 5 years; the Pennsylvania Globe Gas Light Company, of Philadelphia, would maintain 400 or more gasoline lamps, for $23.50 per lamp, on a 3 year contract, the rate to be reduced to $23 if a 5 year contract were agreed to; the Trenton Light and Power Company (which is now performing a goodly share of the lighting) proposed to furnish 200 arcs, of 2,000-candle power each, at the rate of 38 cents per arc per night, the agreement to last for 5 years; the Trenton Street Railway Company agreed to furnish 400 or more incandescent electric lamps, of 25 candle power each—Westinghouse type—on the basis of $22 per lamp for a 3 year contract, or $21.50 per lamp if the contract term were put at 5 years. The last bidder proposed to perform the entire lighting of the city, which is now performed by a mixed system comprising arc, gas and gasoline lamps. The bids were all referred to the Lamp Committee of the City Council. The tenders were based on an every night and all night service.

When the tenders were under discussion—each Company was permitted, through its representative, to explain its position—it was easily discernible that the electricians of New Jersey's capital city are not working harmoniously. Col. Perrine, representing the Street Railway Company that is anxious to foist its incandescent lamps on the city, remarked that his principals operated a first-class electric system and owned an up-to-date generating plant, which would enable them to give a much better service than that maintained by the present contractors, the Trenton Light and Power Company. The Colonel also referred, "with pride," to the fact that Burlington and Bordentown were being lighted by means of incandescent lights; but, as in other instances that have been told of, the Colonel's pride preceded a fall, for this reference to Burlington and Bordentown brought out some hard facts, presented by Mr. Robinson, of the Globe Gas Light Company. Mr. Robinson admitted that in the two places named incandescent electric lamps were employed in the street lighting, but that the system had never given satisfaction, and that the complaints in regard thereto were now louder and more extended than ever. Further, that if the authorities wished proof in support of what he had stated, they could easily obtain the same, without incurring either great expense or much fatigue, by visiting the places noted. In fact, he was not sure that a simple letter dictated to the authorities of either Burlington or Bordentown—and he might add, Mount Holly—would elicit a reply sufficiently condemnatory of the system. The Honorable F. A. Magowan, speaking for the Trenton Light and Power Company, remarked that Col. Perrine's reference by insinuation to the Company he (Magowan) represented, was utterly false, as the Trenton Company had a finely-equipped plant, and that it was managed with the desire and aim to render full service to its patrons, conditions which he did not think were those that existed in the management of the concern represented by Col. Perrine.

THE proprietors of the Consolidated Gas Company, of Baltimore, Md., have applied to the local Appeals Tax Court for a revision of their assessment rating.

MR. C. C. CARPENTER, President of the Southern District Association of Gas Engineers and Managers, in the course of his inaugural address at the annual meeting for this year, which was held in London on February 9th, made the following reference to the paper read by Mr. W. R. Addicks, of Boston, Mass., at the last meeting of the American Gas Light Association: "I cannot here refrain from quoting from a paper read last year before the American Gas Light Association, by Mr. W. R. Addicks. In it he points out the advantages which would accrue to the gas industry as a whole by the federation of its various Associations. Replying to the question, 'What organization would meet this case?' he proceeds as follows: First, a National Association, with active members composed of the engineers and managers of gas companies; secondly, District Associations, with active members composed of engineers and managers of gas companies in the given districts. Membership in a District Association would not necessitate membership in the National Association. A journal of proceedings, to be published by the National Association, but containing also the reports of the District Associations. The National Association to meet yearly in the spring, when the greater number of members could be present; District Associations, three times a year. He goes on to define the composition of the council and committees, and finally directs attention to one or two matters of importance, the co operative investigation of which would bring about greatly improved results. Gentlemen, the American nation can afford to give us a good many points from a federation point of view. But is it not possible that, as regards an industry which we can call especially our own, we may take the wind out of their sails by bringing about, in our Mother Country, such a federation of Associations as our American *confrere* has sketched out? It would, I heartily and earnestly feel, be a good thing for all if the year of grace, 1893, should witness the bringing about of a consummation so devoutly to be wished."

THE papers incorporating the Queen City Gas Light Company, of Buffalo, N. Y., have been filed. From them it is learned that the Company proposes to supply gas to the city and to the citizens of Buffalo; that its capital is put at $500,000; and that Messrs. Henry D. Kirkover Philo D. Beard and Henry Altman are to direct its affairs for the first year.

AT a meeting of the new proprietors of the La Porte (Ind.) Gas and Coke Company, the following officers were chosen: President, William A. Martin; Secretary, R. E. Morrison; Treasurer and Manager, Edward F. Michael.

VICE CHANCELLOR VAN FLEET has formulated an order which terminates the litigation that involved the Central Trust Company, of this city, the Metropolitan Gas Company, of Elizabeth, N. J., and the Elizabethtown Gas Light Company. The latter Company, it will be remembered, purchased the plant and franchises of the Metropolitan Company, at a public sale ordered by the courts at the instance of the Trust Company, in foreclosure proceedings. In the final accounting, Receiver Wiedenfeld put in a claim for services, amounting to $10,000; but the Chancellor cut the claim about 25 per cent.

WE are indebted to Mr. C. W. Hinman, State Gas Inspector for Massachusetts, for a copy of his report of operations for the year past. As usual, the report is well put together, and forms a comprehensive review of how the duties intrusted to his care were performed. Referring to the meter inspection for the year, Mr. Hinman says: "During the past year 16,839 gas meters have been inspected. Of this number, 16,491 were new or recently repaired meters. These meters were presented for inspection by the gas meter manufacturers or the gas companies, as the law requires all gas meters to be inspected before being used to measure the gas supplied to consumers. Any of these meters found to be incorrect were returned for repairs and then retested. The number of meters which had been some time in use, and which were suspected to be incorrect, either by the gas company or by the consumer, and were brought to this office for reinspection, was 348. Of these meters, 105 were found to be too fast, their average error being 5.67 per cent.; 190 were found within the legal limits, namely, 2 per cent. either way; 49 meters were found to be too slow, the average error being 9.28 per cent.; and 4 did not register at all. Eight meters were more than 10 per cent. fast, one of them being 16 per cent. fast; 10 meters were more than 10 per cent. slow, one of them being 45 per cent. slow. The average error of the 344 suspected meters that registered was 0.41 per cent. fast. * * * On the average during the past 10 years, out of every 24 meters brought for reinspection, 14 were correct, 7 averaged 5 per cent. fast, and 3 averaged 11 per cent. slow. It must be remembered that these meters are more likely to be incorrect than the average of meters, for they have been suspected and complained of by someone. The law relating to the reinspection of gas meters provides that, on the request of the consumer, any meter in use shall be reinspected by the State Inspector, and, if incorrect, the whole of the expense shall be borne by the company. If the meter is found to be correct, the consumer pays only the testing fee and the actual expense of removing and resetting the meter. Ordinarily, the total expense is about $1. Occasionally a travelling meter inspector visits some of the cities of the State. His method of testing is by connecting his small meter (sometimes a one light) to the meter to be tested, and then passing gas through both of them. This style of testing can never be more than a rough approximation. The fee charged the consumer for this inspection is usually two to five times as much as he would have to pay, if he paid anything at all, for an official inspection. The test would seem to do the consumer very little good, as no gas company ever trusts any such imperfect test, but sends the meter to the State Inspector. Careless work in disconnecting and connecting the

meters frequently produces leaks or injuries to the meter and fittings. There should be some way of preventing such inspections."

THE Fort Scott (Kansas) Light and Fuel Company has for some weeks past been carrying in the local newspapers a large advertisement, in which is graphically portrayed the danger incident to the use of a gasoline cooking stove, the other light in the picture going to show the safety of the illuminating gas cooker. The main moral to be drawn from the illustration is that the cook who uses the latter apparatus can always count on standing on her feet, whereas the cook who trusts to the gasoline affair is in constant dread of rapidly rising to the kitchen roof—or somewhere else, either in or out of doors, the net result depending usually on the violence of the explosion, the solidity of the kitchen walls, and so on.

A FIRE, caused by the explosion of gas escaping from a leaky valve, occurred last month at the plant of the Holly Springs (Miss.) Gas Company. The damage amounted to about $500, and there was no insurance. The gas supply was at no time cut off from the town.

THE voters of the town of Caldwell, Ohio, at a special election, agreed to an issue of $25,000 of bonds, for the purpose of installing an electric lighting plant, to be operated on public account.

THE local rulers of Kansas City, Mo., some time ago made up their minds that the meter which measures the gas supplied to the City Hall was doing more than its duty. The Gas Company, however, suggested that leaks existed in the service pipes, and accordingly a test was made. The lights were all shut off for the space of an hour, and a reading of the meter proved that 30 feet had "passed off" somewhere. Thereupon the gasfitters were called in; and they did the rest.

"OBSERVER" forwards the following from Westfield, Mass., under date of February 25th: "The Westfield Gas Company proposes this spring to expend a good round sum in the enlargement of its plant. The scheme includes the installing of an additional bench of retorts, the construction of a new gasholder, and some main extensions. It is also on the cards that a cut in the gas rate will be ordered when the betterments are completed. Superintendent Thayer, in common with the New Englanders in general, had a very uneasy winter of it, in respect of complaints about stopped services; but he assumes a very complaisant manner when asked how the sendout for the winter just closed (?) compared with that for the season 1891-2."

THE Waltham (Mass.) Gas Light Company submitted the following proposals for the public lighting of that city, in answer to the invitation of the authorities: "First, for the year 1893, to furnish gas lights in the public street lamps at 8 cents per lamp per night. To furnish incandescent and series lights in the various public offices in the city at list price, less 25 per cent. To furnish arc lights, of 1,200 candle power each, at 27 cents per night; all conditions and terms remaining the same as heretofore. Second, for a 5 year contract; the Gas Company to furnish gas for public street lamps, at 8 cents per night, as before—the margin here being so small that we cannot reduce the price. Furthermore, the number of street lamps continually diminishes, while our expenses in connection therewith remain the same. For series and incandescent lamps we offer, for a 5 years' contract, the list price, less 40 per cent. discount. For arc lights, of 1,200-candle power each, we offer, for a 5 years' contract, 23 cents per light per night, providing that the city increase the number of arc lamps in use, not less than 10 lamps each year during the 5 years—this being the increase that the city has made during the past 6 years. All conditions and terms to be as heretofore."

ACCORDING to the 7th annual report of the State Board of Gas and Electric Light Commissioners, the Waltham Company furnished the city with 62 arc lamps, of 1,200 candle power each, burning from dark to 1 A.M., at the rate of 30 cents each per night; from whence it will be seen that the offers now made show a liberal concession. The rates for incandescent electric lighting are so varied that we will have to refer our readers to the report mentioned. It might be said, however, that the current propositions also show a decided reduction over the contract under which the Company is now performing the service.

THE Philadelphia *North American*, dated Feb. 28, asserts that the Metropolitan Traction Company is negotiating for the purchase of the Gas Companies of Newark, N. J. No doubt the Traction Company would like to secure the ownership of the said properties, but Messrs. Vanderpool, Kelsey, and their associates are very apt to keep the pulp of the Newark orange within easy reach of their own spoons.

"OBSERVER" notes that a striking evidence of the value of gas shares in conservatively managed Eastern gas companies was afforded last month by the eager competition for 10 shares in the stock of the Pittsfield (Mass.) Coal Gas Company, offered at auction, the sale having been ordered by the executors of the estate of F. H. Boltwood. The first bid was $155 per share, and the last bid was $225, at which figure the shares were disposed of to Mrs. Anna Dunbar. The Company's dividend return in 1892 was 12 per cent.

THE negotiations underway for some time looking to the amalgamation of the gas and electric lighting interests of Salt Lake City and Ogden, Utah, have been completed. All these properties are hereafter to be known as the Salt Lake and Ogden Gas and Electric Light Company, the Directors of the same being as follows: W. S. McCormick, George M. Scott, P. L. Williams, V. M. C. Silva, J. Elliot Condict, George F. Penhale and James Moffat. It is more than probable that an extensive series of betterments will be made on the works this season.

THE following summary of the prices bid by the named Companies for the public lamp lighting of Boston for the ensuing year will be of interest—the bids were opened on February 24, and our account of the same is taken from the Boston *Globe*:

East Boston Gas Light Company—For lighting wards 1 and 2, $1.50 per 1,000. This is 10 cents per 1,000 less than it was done by the same Company by the former contract.

Charlestown Gas Light Company—$1.35 per 1,000, which is 20 cents less per 1,000.

Brookline Gas Light Company—For city proper, southern part, $1 per 1,000 to the consumer and 70 cents for public lamps; to consumers in Roxbury, $1, and to the city for street lamps, 70 cents. The old price was $1.85 per 1,000. For Brighton, $1.50 to consumers and $1.25 to the city. For parks, 70 cents.

Dorchester Gas Light Company—$14.93 per post per annum if a New York standard three foot burner is used, or will light, extinguish and take care of 1474 lamps for $29,376.82 per year; if a four foot burner is used, as at present, $36,712.42. The total cost to the city under the old contract was $49,184.43.

South Boston Gas Light Company—$1.30 per 1,000 for an average candle power of 17½; $14.93 per post per year, with a standard three foot burner. Will light, extinguish and care for 535 lamps in South Boston at $10,662.55; if with a four foot burner, $13,325.06. The old contract price was $18,833.07.

Roxbury Gas Light Company—$1.30 per 1,000; average candle power 25; if three foot burner is used, $14.93 per post per year; or will light, extinguish and care for 1,639 lamps in Roxbury at $32,665.27; if with a four foot burner, $40,822.03. The old contract price was $1.50 per 1,000 and a total for the year of $54,393.49.

Jamaica Plain Gas Light Company—$1.70 per 1,000 for all over 900 lamps; $1.75 for less than that number; to consumers, $2, less 20 cents on all bills paid before the 15th. The old contract price was $1.85 to the city.

Boston Gas Light Company—$1 per 1,000 for three foot standard burner which the Company recommends the city to adopt; $11.48 per post per year; will light, extinguish and care for 2,487 lamps in Boston proper at $40,991.98, and if a four foot burner is used, as at present, $50,150.97. Old contract price to city was $1 per 1,000, and the sum for the whole year was $65,753.78.

BROKER WINCH the other day secured a verdict, in the Court of Common Pleas, for $5,000 against Wallace C. Andrews, ex-President of the Standard Gas Company, the plaintiff's claim (it was for $9,500) being based on his successful efforts to induce Mr. Babbitt, of washing soap fame, to purchase 1,000 shares of common and preferred stock in the Standard Company, when Andrews was doing "the best he could" with those shares a few years ago. Winch was to have been paid $5 per share for every share that was sold above a certain price, but it seems that on the Babbitt transaction Winch's original *douceur* from Andrews was only $500, or 25 cents per share. Ex-Judge Gedney conducted the case for Winch, and handled it in masterly fashion, too.

THE Standard Gas Company will construct a large holder on property secured by it on East 19th street. This is the way the Company is at present managed—its proprietors prefer to sell gas rather than to sell shares; the cart is no longer in front of the horse.

THE AMERICAN GAS LIGHT JOURNAL

A. M. CALLENDER & CO.,

PROPRIETORS.

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MONDAY, MARCH 6, 1893.

The Market for Gas Securities.

Consolidated gas showed some strength during the week, and opened to day (Friday) at 129 bid, ex dividend, as against 129½, dividend on, last Friday. It looks to be pretty well settled that the rate bills before the Legislature will not be "pressed," outside of the committee, although in the sacred confines of that select body some consideration no doubt will be given to the matter. The attitude assumed by the Equitable Company towards the Consolidated is causing much comment, for there is no doubt about it that the canvassing for customers now going on only lacks the feature of a cut rate to make it open warfare. The Equitable people ought to go slow; they are making a pretty penny just now, so why disturb the serenity of the situation. The Mutual Company is moving along steadily, and so is the Standard. The latter is about to put up a new holder on East 19th street, and the stock is stronger on an important decision recently promulgated respecting the Company's right to pipe the city.

Over in Brooklyn the quotations show a slight falling off in values, save in the instance of Nassau, which holds firm at 170 bid. It looks very much as if the Addicks' and Rogers' interests were no longer inimical, and that the differences have been (partially at least) smoothed over. The Brooklyn atmosphere ought to clear very soon. Bay State gas is very weak at 36 bid, and we imagine a 10 point turn on the bull side would result from a purchase at that figure. Chicago gas opened strong to day, at 91½, and Baltimore gas is in less demand, at 61. The general situation is that of strength.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks,

16 WALL ST., NEW YORK CITY.

MARCH 6.

☞ All communications will receive particular attention.
☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	129	129½
Central	500,000	50	90	95
" Scrip	220,000	—	—	100
Equitable	4,000,000	100	198	200
" Bonds	1,000,000	—	106	108
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	110	115
Mutual	3,500,000	100	142	—
" Bonds	1,500,000	—	100	102
Municipal, Bonds	750,000		—	—
Northern		50	—	—
" Bonds	150,000	—	—	100
Richmond Co., S. I.	346,000	50	—	—
" Bonds	20,000	—	—	—
Standard Gas Co—				
Common Stock	5,000,000	100	35	40
Preferred	5,000,000	100	88	91x
Yonkers		50	112	—
Gas Co's of Brooklyn.				
Brooklyn	2,000,000	25	136	138
Citizens	1,200,000	20	108	110
" S. F. Bonds	320,000	1000	—	103
Equity Gas Light Co.	2,000,000	100	45	—
Bonds	1,000,000	—	—	75
Fulton Municipal	3,000,000	100	150	152
" Bonds	300,000		102	—
Peoples	1,000,000	10	—	112
" Bonds (7's)	368,000	—	100	—
" " (6's)	94,000	—	100	—
Metropolitan	870,000	100	140	—
" Bonds (5's)	70,000	—	100	—
Nassau	1,000,000	25	170	—
" Ctfs	700,000	1000	99	100
Williamsburgh	1,000,000	50	155	—
" Bonds	1,000,000	—	107	110
Out of Town Gas Companies.				
Boston United Gas Co.—				
1s Series S.F. Trust	7,000,000	1000	80½	82
2d " " "	3,000,000	1000	—	69
Bay State Gas Co.—				
Stock	5,000,000	50	36½	37
Income Bonds	2,000,000	1000	65	70
Buffalo Mutual, N. Y.	750,000	100	110	—
" Bonds	200,000	1000	95	100
Citizens, Newark	1,000,000	50	155	160
Chicago Gas Company.	25,000,000	100	91½	91⅝
Chicago Gas Light & Coke Co.—				
G't'd Gold Bonds	7,650,000	1000	85	90½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1000	—	101
People's Gas and Coke Co., Chicago—				
1st Mortgage	2,100,000	1000	—	108
2d "	2,500,000	1000	104	105
Consumers Gas Light Co., Jersey City	2,000,000	100	25	—
Bonds	600,000	1000	85	90

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